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(71)Applicant : KOKUSAI ELECTRIC CO LTD

(72)Inventor : YUYA KOJI

               MAKITANI MASAHIRO

               TAKEDA TOMOHIKO

(54) CLEANING SYSTEM FOR SEMICONDUCTOR MANUFACTURING EQUIPMENT AND ITS CONTROL METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To automatically execute a cleaning treatment and a predeposition treatment, and improve production efficiency, by installing a control means which stores the number of times of film formation treatments to a semiconductor device, and executes each treatment means to a specified number of times of film formation treatments.

SOLUTION: In a control part 1, cleaning recipe data are set on a cleaning recipe edit image plane, a gas cleaning method is set, and a command for gas cleaning is delivered to a sequencer 5, which outputs the command of a cleaning internal treatment and its cleaning recipe data to each controller 6 according to the cleaning recipe data. Firstly, an etching treatment command is outputted, and etching treatment is executed by the controller 6. Secondary, a residue treatment command is outputted, and a residue treatment is executed by the controller 6. A wafer for the test is carried in a film forming chamber. Finally, a command of a predeposition treatment is outputted, and a predeposition treatment is executed by the controller 6.
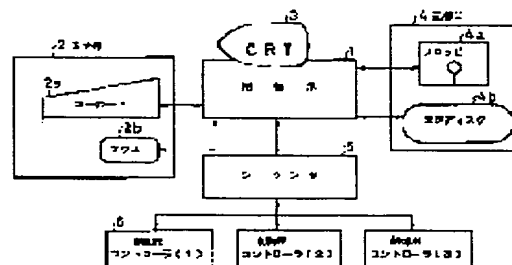
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(71)出願人　000001122
　　　国際電気株式会社
　　　東京都中野区東中野三丁目14番20号
(72)発明者　油谷　広治
　　　東京都中野区東中野三丁目14番20号　国際
　　　電気株式会社内
(72)発明者　▲まき▼谷　雅広
　　　東京都中野区東中野三丁目14番20号　国際
　　　電気株式会社内
(72)発明者　竹田　智彦
　　　東京都中野区東中野三丁目14番20号　国際
　　　電気株式会社内
(74)代理人　弁理士　船津　暢宏　（外1名）

(54)【発明の名称】　半導体製造装置用クリーニングシステム及びその制御方法

(57)【要約】

【課題】　予め設定したクリーニング処理方法及びプレデポ処理方法等を記憶しておき、成膜室での特定成膜回数に対してクリーニング処理及びプレデポ処理を自動的に実行して生産効率を向上させ、更に、定期的にクリーニングを行うことにより、不良の発生を防止することができる半導体製造装置用クリーニングシステム及びその制御方法を提供する。

【解決手段】　成膜室内に付着した異物を取り除くエッチング処理と、成膜室内の残渣処理と、成膜室内を成膜条件に整えるプレデポ処理とを制御用コントローラ6で実行させ、制御部1が特定の成膜処理回数に対して各処理のいずれかを選択的に又は連続して実行させる半導体製造装置用クリーニングシステム及びその制御方法である。
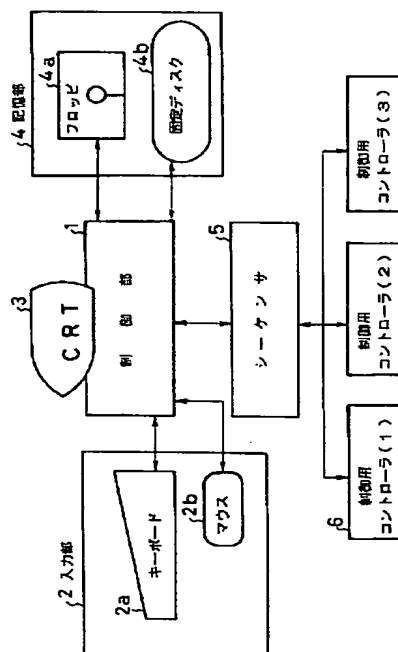
CLAIMS

[Claim(s)]
[Claim 1] The cleaning system for semiconductor fabrication machines and
equipment carry out having the etching processing means perform the etching
processing which removes the foreign matter adhering to the membrane-formation
interior of a room, the residue processing means perform the residue processing
which removes the residue of said membrane-formation interior of a room, the pre
depository processing means carry out the pre depository processing which prepares
to membrane-formation conditions in said membrane-formation interior of a room,
and the control means that the count of membrane-formation processing to a
semiconductor device memorizes [control means], and perform each of said
processing means to the specific count of membrane-formation processing as the
description.
[Claim 2] The control approach of the cleaning system for semiconductor fabrication
machines and equipment according to claim 1 that a control means is characterized
by performing selectively an etching processing means, a residue processing means,
or a pre depository processing means to the specific count of membrane formation
processing.
[Claim 3] The control approach of the cleaning system for semiconductor fabrication
machines and equipment according to claim 1 that a control means is characterized
by continuing in order and performing an etching processing means, a residue
processing means, and a pre depository processing means to the specific count of
membrane formation processing.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention mitigates the activity of the operator who starts the cleaning system for semiconductor fabrication machines and equipment which cleans the membrane formation room of semiconductor fabrication machines and equipment, such as a CVD system, especially requires for cleaning, can make unnecessary temperature fall and temperature up of a membrane formation room, can make it the original membrane formation conditions easily, and relates to the cleaning system for semiconductor fabrication machines and equipment which productive efficiency is raised and can prevent a defect's generating, and its control approach.
[0002]
[Description of the Prior Art] The CVD (Chemical Vapor Deposition) equipment used by the production process of semiconductor devices, such as LSI, is equipment which makes membrane formation of SiO2, SiNx, W (tungsten), etc. deposit on a wafer by the chemical reaction in a gaseous phase. For example, SiO2 The film makes a silane (SiH4) and oxygen (O2) react, and is formed, and the tungsten film is WF6. It uses as generation gas and forms.
[0003] In a CVD system, if the count of membrane formation increases, the film made to deposit on a wafer and the film of this component will adhere to the membrane formation indoor section, but if this film is left, since it will become the cause of defects, such as membraneous lowering, a membrane formation room needs to be cleaned.
[0004] As the cleaning approach of the membrane formation room of the conventional CVD system, an operator removes the components of the product made from a quartz, or metal attached in the membrane formation interior of a room, and it is cleaning by performing installation after washing with the cleaning tank etc.
[0005] The conventional cleaning approach is explained concretely. First, in order to remove the components of the membrane formation interior of a room, the temperature of the membrane formation interior of a room is made to lower, if it becomes 100 degrees C or less, a membrane formation room will be opened, and a membrane formation chamber portion article is removed. And a cleaning tank etc. washes a membrane formation chamber portion article, it is made to dry and the activity which attaches a membrane formation chamber portion article in the membrane formation interior of a room is done.
[0006] Then, temperature up of the temperature of the membrane formation interior of a room is carried out to the original temperature, and it examines whether it becomes a target membrane formation rate so that it may become the original membrane formation conditions. And if the membrane formation rate after washing is equal to the original membrane formation rate, cleaning treatment will carry in a product wafer and will resume CVD processing noting that it completes.

[0007] Here, the trial of the membrane formation rate after washing performs fixed time amount deposition (pre depository) on the conditions which carried in the dummy wafer in equipment and were set up, and it computes a membrane formation rate by measuring the thickness of the formed thin film.
[0008]
[Problem(s) to be Solved by the Invention] However, by the above-mentioned conventional cleaning approach, at every cleaning, required [removal and installation of a membrane formation chamber portion article], since the temperature fall and the temperature-up activity were required, returning to the original membrane formation conditions after cleaning took time amount, and there was a trouble that productive efficiency was bad.
[0009] Then, although the gas cleaning which removes the product which adhered etching gas to the membrane formation interior of a room in a sink and equipment by etching could be considered, in order that the operator might memorize the count of membrane formation and might determine a cleaning stage by decision of an operator, when the cleaning stage was mistaken, membraneous quality deteriorated and there was a trouble of becoming the cause of a poor product.
[0010] Since succeeded in this invention in view of the above-mentioned actual condition , and it makes a cleaning art , a pre depository art , etc. which were set up beforehand memorize , performs cleaning treatment and pre depository processing automatically to the count of specific membrane formation in a membrane formation room , and raises productive efficiency and cleaning is perform still more nearly periodically , it aims at provide the cleaning system for semiconductor fabrication machines and equipment which can prevent a defect generating , and its control approach .
[0011]
[Means for Solving the Problem] Invention according to claim 1 for solving the trouble of the above-mentioned conventional example An etching processing means to perform etching processing which removes the foreign matter adhering to the membrane formation interior of a room in the cleaning system for semiconductor fabrication machines and equipment, A residue processing means to perform residue processing which removes the residue of said membrane formation interior of a room, and a pre depository processing means to perform pre depository processing in which said membrane formation interior of a room is prepared on membrane formation conditions, The count of membrane formation processing to a semiconductor device is memorized, it is characterized by having the control means which performs said each processing means to the specific count of membrane formation processing, cleaning of the membrane formation interior of a room can be automated, productive efficiency is raised, and a defect's generating can be prevented.
[0012] in the control approach of the cleaning system for semiconductor fabrication machines and equipment according to claim 1 , the control means be characterize by to perform selectively an etching processing means , a residue processing means , or a pre depository processing means to the specific count of membrane formation processing , cleaning of the membrane formation interior of a room automate , invention according to claim 2 for solve the trouble of the above-mentioned conventional example raise productive efficiency , and a defect generating can prevent .
[0013] In the control approach of the cleaning system for semiconductor fabrication machines and equipment according to claim 1 , the control means be characterize by to continue in order and to perform an etching processing means , a residue processing means , and a pre depository processing means to the specific count of

membrane formation processing , cleaning of the membrane formation interior of a room can automate , invention according to claim 3 for solve the trouble of the above-mentioned conventional example raise productive efficiency , and a defect generating can prevent .

[0014]

[Embodiment of the Invention] It explains referring to a drawing about the gestalt of operation of this invention. Drawing 1 is a cleaning structure-of-a-system block diagram for semiconductor fabrication machines and equipment concerning the gestalt of operation of this invention. The cleaning system for semiconductor fabrication machines and equipment concerning the gestalt of operation of this invention The control section 1 which publishes the command for gas cleaning based on edit of the cleaning conditions (gas cleaning recipe) of a membrane formation room, setting out of the activation approach, and it, The input section 2 which inputs cleaning conditions and the activation approach, and CRT3 which displays the edit display of cleaning conditions, The storage section 4 which memorizes the edited cleaning conditions, and the sequencer 5 which publishes directions for the controller 6 for control based on the cleaning command published from the control section 1, Controller for control which follows directions from a sequencer 5, and controls and supervises the membrane formation interior of a room (1) - (3) It consists of 6.

[0015] Next, work of each part is explained concretely. A control section 1 performs edit of the cleaning conditions of a membrane formation room, and setting out of the activation approach, and publishes a cleaning command to a sequencer 5 based on the set-up data.

[0016] Here, edit of the cleaning conditions (gas cleaning recipe) of a membrane formation room is performed using the gas cleaning recipe edit display displayed on CRT3, reads the recipe data which create newly, or create before and are memorized by the storage section 4, adds correction, and memorizes it in the storage section 4. If the file name specified when memorizing is specified in setting out of the activation approach, in case the gas cleaning recipe data memorized by the storage section 4 will publish a gas cleaning command from a control section 1, reading appearance of them is carried out and they are outputted to a sequencer 5.

[0017] In addition, a gas cleaning recipe chooses ON/OFF of conditioning, such as the time amount in two processings, the etching processing which is internal processing of cleaning treatment, and residue processing, temperature, a class of gas to be used and a flow rate of gas, RF power, and a pressure, and activation of cleaning internal processing (etching processing, residue processing).

[0018] Moreover, issuance of the command for gas cleaning will publish the command for cleaning to a sequencer 5 based on it, if an operator sets up activation schedules, such as whether to perform cleaning treatment for how many times of every membrane formation processings, when carrying out automatically, the recipe data (file name of the gas cleaning recipe memorized by the storage section 4 etc.) to perform, whether it performs automatically whether a manual performs gas cleaning treatment, and. In addition, when an activation schedule is set up, if a control section 1 counts the count of activation of membrane formation processing and reaches the specified count, processing which publishes a gas cleaning command will be performed to a sequencer 5.

[0019] The input sections 2 are input units, such as keyboard 2a or mouse 2b, perform the recipe entry of data of ON/OFF of activation of cleaning internal processing, and each internal processing using a gas cleaning recipe edit display, and set up the cleaning activation approach.

[0020] Moreover, the storage sections 4 are storage, such as floppy disk 4a or fixed-disk 4b, and store the cleaning recipe data inputted from the input section 2 using the

gas cleaning recipe edit display.

[0021] A sequencer 5 is based on the command for gas cleaning published from the control section 1. Each controller for control (1) - (3) Receive and directions and cleaning recipe data of cleaning internal processing to perform are transmitted. furthermore, the process of each cleaning internal processing -- each controller for control (1) - (3) from -- it supervises whether there is any conflict between the processing monitor data transmitted and the set-up cleaning recipe data.

[0022] The controller 6 for control controls the membrane formation interior of a room of semiconductor fabrication machines and equipment based on activation directions and cleaning recipe data of cleaning internal processing transmitted from a sequencer 5, and supervises the device status under activation at the time of cleaning internal-processing activation, and transmits processing monitor data to a sequencer 5.

[0023] In addition, although it is made the configuration which connected three controllers 6 for control in drawing 1 , two or more set number is connected, the cleaning recipe data to each membrane formation room (or semiconductor fabrication machines and equipment) are set up, and it controls separately, or grouping of the membrane formation room can be carried out, and it can also control by the same cleaning recipe data for every group.

[0024] Next, the control approach in the cleaning system for semiconductor fabrication machines and equipment of the gestalt of operation of this invention is explained using drawing 2 . Drawing 2 is flow chart drawing showing the processing actuation in the control section 1, the sequencer 5, and the controller 6 for control of the cleaning system for semiconductor fabrication machines and equipment of operation of this invention. [of a gestalt] In addition, drawing 2 shows the processing actuation at the time of being set up so that etching processing, residue processing, and pre depository processing may be continuously performed as combination of internal processing of cleaning treatment.

[0025] The control approach in the cleaning system for semiconductor fabrication machines and equipment of the gestalt of operation of this invention sets up cleaning recipe data using a gas cleaning recipe edit display by the control section 1 first (100), sets up the gas cleaning activation approach, and publishes the command for gas cleaning to a sequencer 5 (110).

[0026] And the sequencer 5 which received the command for gas cleaning from the control section 1 outputs directions of cleaning internal processing, and its cleaning recipe data to each controller 6 for control according to cleaning recipe data. Take out activation directions of etching processing with the example of drawing 2 first, and etching processing is performed by the controller 6 for control (120). Next, issue activation directions of residue processing and residue processing is performed by the controller 6 for control (130). Next, the wafer for a test (substrate) is carried in to a membrane formation room (140), finally activation directions of pre depository processing are issued, pre depository processing is performed by the controller 6 for control (150), and gas cleaning treatment is ended.

[0027] Here, etching processing is processing which flows the special gas for cleaning, is made to cause a foreign matter and a chemical reaction, and is removed, in order to remove the thin film (foreign matter) adhering to each part article of the membrane formation interior of a room in the process which forms a thin film in a CVD system in the membrane formation interior of a room.

[0028] Moreover, residue processing is processing which flies the foreign matter which could not remove by etching processing and remained with gas pressure (wind pressure) using inert gas, such as nitrogen.

[0029] And pre depository processing is processing which prepares the environment where original CVD processing (membrane formation processing) is performed, and

tests CVD processing using a test wafer.

[0030] In addition, as combination of internal processing of gas cleaning treatment, six kinds of combination as follows is possible.

(1) Perform only etching processing.

(2) Perform only residue processing.

(3) Activation of etching processing and residue processing.

(4) Perform only pre depository processing.

(5) Activation of etching processing, residue processing, and pre depository processing.

(6) Don't process.

[0031] In addition, pre depository processing must be considered as 3 processing continuation, when it cannot combine with either etching processing or residue processing but combines with either.

[0032] Which combination is chosen chooses in edit processing (processing 110) of the gas cleaning recipe in a control section 1.

[0033] Here, edit processing of the gas cleaning recipe in a control section 1 is explained using drawing 3 . Drawing 3 is the explanatory view showing the setting-out form of the gas cleaning recipe edit display of the gestalt of operation of this invention. In addition, it sets to drawing 3 and is a controller for control (1). - (3) Corresponding cleaning recipe data are set as R1-R3.

[0034] Edit processing of the gas cleaning recipe in the control section 1 of the gestalt of operation of this invention sets up the recipe data corresponding to the controller for control using a gas cleaning recipe edit display as shown in drawing 3 . As each recipe data, the processing conditions (Etching Set Value of drawing 3) of etching processing and the processing conditions (Cleaning Set Value of drawing 3) of residue processing are set up, and ON/OFF of activation of each processing is set up further.

[0035] Processing conditions are time amount, temperature, the class of gas to be used and the flow rate of gas, RF power, a pressure, etc., and setting out of ON/OFF of activation of each processing shows OFF here, when ON will be shown and it will not set it up at all in ** (null), if x is set up in **.

[0036] With and setting out of the gas cleaning activation approach performed by the control section 1 The recipe data to perform (file name of the gas cleaning recipe memorized by the storage section 4 etc.), Whether it performs automatically whether a manual performs gas cleaning treatment and when carrying out automatically, an operator sets up activation schedules, such as whether to perform cleaning treatment for how many times of every membrane formation processings, from the input section 2. In a control section 1, the command for cleaning is published to a sequencer 5 based on the set-up activation approach.

[0037] In addition, if the count which counted the count of activation of membrane formation processing, and was specified is reached when an activation schedule is set up, in order to incorporate gas cleaning treatment between the usual membrane formation processings, the command for gas cleaning will be published to a sequencer 5. Thereby, an operator can count and memorize the count of membrane formation, does not need to perform cleaning of a membrane formation room serially to the count of membrane formation, and can raise working efficiency.

[0038] Next, processing of the sequencer 5 of the gestalt of operation of this invention is concretely explained using drawing 4 . Drawing 4 is flow chart drawing showing processing actuation of the sequencer 5 of the gestalt of operation of this invention. Processing actuation of the sequencer 5 of the gestalt of operation of this invention will be started if a gas cleaning command is received from a control section 1, it judges whether etching processing is performed first (200), and when

performing, directions and its recipe data of etching processing are transmitted to the controller 6 for control, and etching processing is performed (205). Next, it judges whether residue processing is performed (210), and when performing, directions and its recipe data of residue processing are transmitted to the controller 6 for control, and residue processing is performed (215). Next, it judges whether pre depository processing is performed (220), and when performing, directions and its recipe data of pre depository processing are transmitted to the controller 6 for control, pre depository processing is performed (225), and processing of a sequencer 5 is ended.

[0039] In addition, while performing etching processing, residue processing, and pre depository processing by the controller 6 for control, in a sequencer 5, it supervises whether there is any conflict in the processing monitor data of the membrane formation interior of a room transmitted from the controller 6 for control, and the recipe data set up by the control section 1.

[0040] According to the cleaning system for semiconductor fabrication machines and equipment and its control approach of a gestalt of operation of this invention The data about activation of cleaning are beforehand edited on the screen of CRT3. Moreover, a control section 1 counts and memorizes the count of membrane formation processing to a semiconductor device. Since the controller 6 for control is controlled through a sequencer 5, and a control section 1 is independent, or combines etching processing, residue processing, and pre depository processing and he is trying to make them perform continuously according to the edit data concerned when reaching the count of specification Since it can automate, and is effective in the ability to raise productive efficiency and it can clean periodically by the program, without depending cleaning of the membrane formation interior of a room on handicraft, it is effective in the ability to prevent the defect of a semiconductor device.

[0041]

[Effect of the Invention] Since according to invention according to claim 1 it has an etching processing means, a residue processing means, and a pre depository processing means and the control means is considering as the cleaning system for semiconductor fabrication machines and equipment which performs each processing means to the specific count of membrane formation processing, cleaning of the membrane formation interior of a room can be automated, productive efficiency is raised, and the effectiveness that a defect's generating can be prevented is.

[0042] Since the control means is considering as the control approach of the cleaning system for semiconductor fabrication machines and equipment according to claim 1 of performing selectively an etching processing means, a residue processing means, or a pre depository processing means to the specific count of membrane formation processing according to invention according to claim 2, cleaning of the membrane formation interior of a room can be automated selectively, productive efficiency is raised, and the effectiveness that a defect's generating can be prevented is.

[0043] Since the control means is considering as the control approach of the cleaning system for semiconductor fabrication machines and equipment according to claim 1 of continuing in order and performing an etching processing means, a residue processing means, and a pre depository processing means to the specific count of membrane formation processing according to invention according to claim 3, cleaning of the membrane formation interior of a room can be automated continuously, productive efficiency is raised, and the effectiveness that a defect's generating can be prevented is.

[Translation done.]